Software Quality Engineering

Lab Task 06

Group No : 2
Section : BSSE – V – A
Date: 25th Oct
Submitted To : Sir Naseer Jan

Contents

1.Group Information

Member Name	*Role*	*Responsibilities*
Muhammad Shamoil	***Moderator***	***Coordinated all members, scheduled/led the inspection meeting, and summarized all findings into the final PDF report.***
Arslan Jaffer	***Reworker***	***Responsible for implementing the "Rework" (fixing all identified defects) based on the Scribe's final defect log***
Ali Raza	***Reader***	***Guided the inspection meeting by reading code sections aloud and created the fixed UML Class Diagram (Section 3.2).***
Muhammad Awais	***Inspector***	***Performed individual preparation. Inspected the code against all provided checklists and SOLID principles to find defects.***
Abdullah Awan	***Analyzer / Scribe***	***Recorded all defects identified during the meeting. Classified each defect's severity and logged it in the official defect sheet (Section 4.1).*** ***Helped Reowrker in Fixing the Defects***

2. Software Inspection Process Overview

2.1. Inspection Process Followed

Our team conducted a formal Software Inspection process following the six standard phases:

Planning: The Moderator (Muhammad Shamoil) assigned roles and scheduled the main inspection meeting via the group chat. All checklists and the defective code were distributed.

Overview: The Moderator gave a brief overview of the project requirements and the expected deliverables.

Preparation: Each team member, especially the Inspector (Abdullah Awan), reviewed the UML diagram and all .java files individually using the checklists before the meeting.

Inspection Meeting: The full team met online. The Reader (Ali Raza) guided the discussion. The Inspector raised issues, which were discussed by the team. The Scribe (Awais) formally logged every confirmed defect.

Rework: After the meeting, the defect log was given to the Reworker (Arslan Jaffer) to fix all identified issues.

Follow-up: The Moderator verified that all logged defects were resolved by the Reworker, confirming the project was in a stable, executable state.

2.2. Meeting and Time Log

Time: 8PM – 9:30PM

Duration: 1.5 hours

Venue/Platform: WhatsApp Group Call

Attendees: Muhammad Shamoil, Arslan Jaffer, Ali Raza, Abdullah Awan, Awais

3.UML Class Diagram Review

3.1. Analysis of Original UML Diagram

3.1.1. Interface Segregation Principle (ISP) Violation

The primary issue is the SpaceCraftOperations interface. This is a "fat interface" because it bundles multiple, unrelated responsibilities into a single contract. As implied by the project description and the various concrete classes, this interface contains methods for:

1. Launching (e.g., launch())
2. Landing (e.g., land())
3. Maneuvering (e.g., executeManeuver())
4. Communicating (e.g., transmitData())

This violation forces any class that implements it to also implement methods it has no use for.
Example: A ParachuteLanding class only needs to land(). It should not be forced to have methods for launch() or transmitData(). This leads to defective code where these methods are left empty or throw exceptions.

Example: A LaserCommunication class only needs to transmitData(). It has no concept of landing or launching.

3.1.2. Single Responsibility Principle (SRP) Violation

This violation is a direct consequence of the ISP violation.

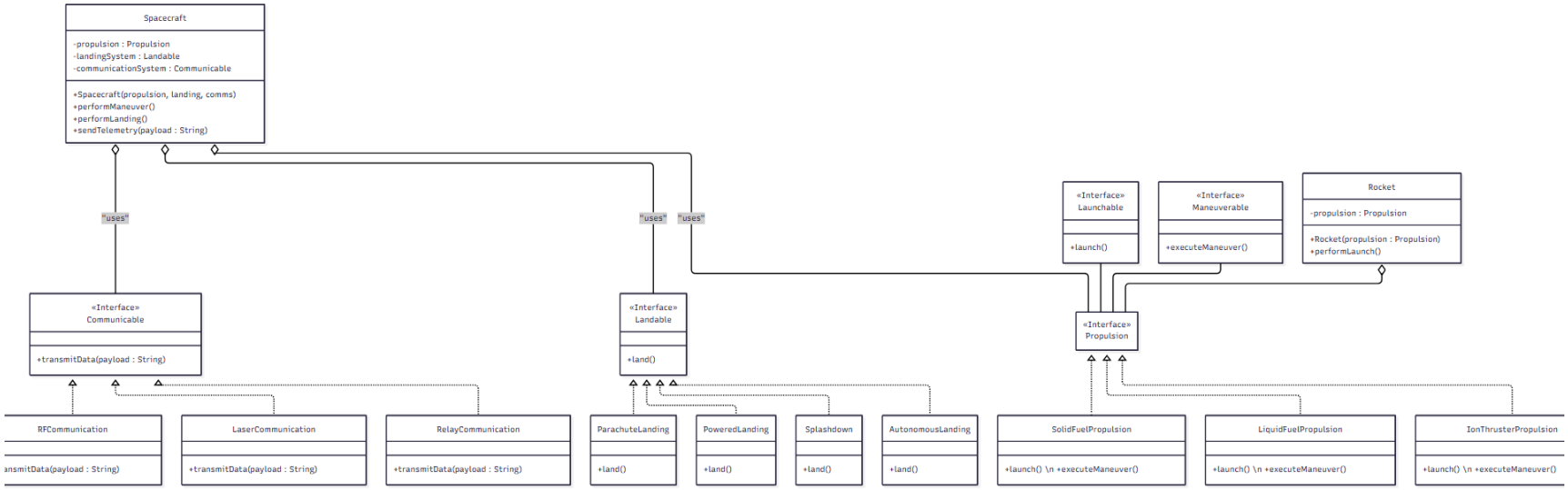
1. **At the Interface Level:** The SpaceCraftOperations interface violates SRP because it is responsible for defining contracts for several different "concerns" (landing, propulsion, communication).
2. **At the Class Level:** Any class implementing this "fat interface" is forced to violate SRP. For instance, a SolidFuelPropulsion class should *only* be responsible for propulsion. The original design, however, forces it to also be responsible for communication and landing, even if those methods are empty.

3.1.3. Dependency Inversion Principle (DIP) & Open/Closed Principle (OCP) Violation: Tight Coupling

The diagram shows high-level classes, like Rocket, having direct associations with low-level, concrete classes like SolidFuelPropulsion or ParachuteLanding.

1. **DIP Violation:** This is a clear violation of the Dependency Inversion Principle, which states that high-level modules should not depend on low-level modules; both should depend on abstractions. The Rocket class should *only* depend on interfaces (abstractions) like Propulsion, Landable, and Communicable, not on the concrete implementations.
2. **OCP Violation:** This tight coupling directly violates the Open/Closed Principle. The Rocket class is not "open for extension" and "closed for modification."
    - **Example:** If we want to add a new LiquidFuelPropulsion type, we would have to modify the Rocket class to accept or instantiate this new concrete class.
    - **The Fix:** By depending on the Propulsion interface (following DIP), we can create a new LiquidFuelPropulsion class and *pass it* to the Rocket without ever changing a single line of code inside Rocket.

3.2. Fixed UML Class Diagram


Spacecraft
-propulsion : Propulsion
-landingSystem : Landable
-communicationSystem : Communicable
+Spacecraft(propulsion, landing, comms)
+performManeuver()
+performLanding()
+sendTelemetry(payload : String)
"uses"
"uses"
"uses"
«Interface»
Communicable
+transmitData(payload : String)
«Interface»
Landable
+land()
«Interface»
Launchable
+launch()
«Interface»
Maneuverable
+executeManeuver()
Rocket
-propulsion : Propulsion
+Rocket(propulsion : Propulsion)
+performLaunch()
«Interface»
Propulsion
RFCommunication
ansmitData(payload : String)
LaserCommunication
+transmitData(payload : String)
RelayCommunication
+transmitData(payload : String)
ParachuteLanding
+land()
PoweredLanding
+land()
Splashdown
+land()
AutonomousLanding
+land()
SolidFuelPropulsion
+launch() \n +executeManeuver()
LiquidFuelPropulsion
+launch() \n +executeManeuver()
IonThrusterPropulsion
+launch() \n +executeManeuver()

4. Source Code Inspection

4.1. Defect Log

Defect ID	File Name & Line	Defect Description	Checklist Reference	Severity	SOLID Violation (if any)	Recommended Fix
Critical Defects (Compilation Failures & Crashes)						
D-001	Rocket.java, Line 46	int status = 1 / 0; - Code contains a "Divide by Zero" exception, which will crash the program during performLaunch().	Java Checklist: 4.1 (Bugs)	**Critical**	N/A	Remove the line.
D-002	Rocket.java, Line 60	landingSystem.land(); - This line will not compile. The Landable interface is empty, and concrete classes have incompatible land() signatures.	Custom Checklist: 2.1 (Design)	**Critical**	N/A	1. Add void land(); to Landable. 2. Update all implementing classes to @Override void land(); with no parameters.
D-003	SpaceDemo.java, Line 46	for (int i = 0; i <= samples.length; i++) - Loop condition causes an ArrayIndexOutOfBoundsException on the final iteration.	Java Checklist: 4.2 (Bugs)	**Critical**	N/A	Change loop condition to i < samples.length.
D-004	SpaceDemo.java, Line 32	rocket.setPropulsion(ion); - This line will not compile because IonThrusterPropulsion does not implement the Propulsion interface.	Custom Checklist: 2.1 (Design)	**Critical**	N/A	Add implements Propulsion to IonThrusterPropulsion class.
D-005	Launchable.java, Line 3	Interface name is 1launchable. This is a Java syntax error; identifiers cannot start with a number.	Java Checklist: 1.1 (Syntax)	**Critical**	N/A	Rename interface to Launchable.
D-006	Maneuverable.java, Line 3	private execute = "maneuver"; - Interfaces cannot contain private fields. This is a Java syntax error.	Java Checklist: 1.1 (Syntax)	**Critical**	N/A	Remove the line.
D-007	ParachuteLanding.java, Line 15	return name+2=3; - The toString() method contains a syntax error (invalid assignment).	Java Checklist: 1.1 (Syntax)	**Critical**	N/A	Fix to return name;
High Severity Defects (Design & SOLID)						
D-008	Propulsion.java, Line 6	int getFuelLevel(); - The interface forces all implementing classes to have a getFuelLevel() method.	Checklist 1: 3.2 (ISP)	**High**	**ISP**	Remove getFuelLevel() from the Propulsion interface. It is an unrelated responsibility.
D-009	Landable.java, Line 3	The interface is empty. It provides no contract for the land() method.	Checklist 1: 3.1 (Design)	**High**	**ISP**	Add void land(); to the interface.
D-010	RelayCommunication.java, Line 8	transmitData(...) method has a different signature than the Communicable interface. It does not correctly implement the interface.	Custom Checklist: 2.1 (Design)	**High**	**LSP**	Change method signature to @Override public void transmitData(String payload).
D-011	Rocket.java, Line 23	setIonThruster(IonThrusterPropulsion ion) - The high-level Rocket class depends directly on the low-level concrete class IonThrusterPropulsion.	Checklist 1: 5.2 (DIP)	**High**	**DIP / OCP**	Remove this method. The SetPropulsion(Propulsion p) method should be used instead (after fixing its name).
D-012	SolidFuelPropulsion.java, Line 16	if (mode == "AUTO") - String comparison is performed using == instead of .equals().	Java Checklist: 4.4 (Bugs)	**High**	N/A	Change comparison to if ("AUTO".equals(mode)).
D-013	SpaceDemo.java, Line 31	if (ion.name == "IonThruster") - String comparison is performed using == instead of .equals().	Java Checklist: 4.4 (Bugs)	**High**	N/A	Change comparison to if ("IonThruster".equals(ion.name)).
D-014	Rocket.java, Line 51	if (propulsion == null) - A potential NullPointerException is checked, but execution is not stopped, causing a crash on the next line.	Java Checklist: 4.3 (Bugs)	**High**	N/A	if (propulsion == null) { throw new IllegalStateException("..."); }
Medium Severity Defects (Error Handling & SRP)						
D-015	SpaceDemo.java, Line 41	catch (Exception e) {} - An empty catch block is used, which silently swallows the FileInputStream error.	Checklist 3: 5.1 (Errors)	**Medium**	N/A	Log the exception (e.g., e.printStackTrace();) or handle it.
D-016	Rocket.java, Line 25	rocketCount++; - A setter method (setIonThruster) has a side effect of modifying a global static counter.	Checklist 1: 1.1 (SRP)	**Medium**	**SRP**	Remove this line. Counters should be managed by a factory or a separate class.
D-017	Rocket.java, Line 18	public static int rocketCount = 0; - Public, static, mutable field breaks encapsulation.	Checklist 2: 2.1 (Encap)	**Medium**	N/A	Make the field private or manage it via a factory.
D-018	SpaceDemo.java, Line 35	The else branch following if (magic > 0) is **dead code** because magic is a hardcoded constant (42).	Checklist 3: 7.1 (Unused)	**Medium**	N/A	Remove the unreachable else block.
Low Severity Defects (Naming & Style)						
D-019	Maneuverable.java, Line 2	Interface name maneuverable violates Java Class Naming Conventions (should be PascalCase).	Checklist 2: 1.1 (Naming)	**Low**	N/A	Rename to Maneuverable.
D-020	Rocket.java, Line 30	Method name SetPropulsion violates Java Method Naming Conventions (should be camelCase).	Checklist 2: 1.2 (Naming)	**Low**	N/A	Rename to setPropulsion.
D-021	SpaceDemo.java, Line 3	import java.util.*; - Use of wildcard imports is discouraged.	Checklist 2: 1.5 (Style)	**Low**	N/A	Use explicit imports (e.g., java.util.Scanner).
D-022	IonThrusterPropulsion.java, Line 6	public String name = "IonThruster"; - Public field breaks encapsulation.	Checklist 2: 2.1 (Encap)	**Low**	N/A	Make field private final and use toString() or a getter.

Given Checklist are filled are separate documents

4.2. Summary of Code Fixes

Following the inspection meeting, the team entered the **Rework** phase. All 22 defects identified in the Defect Log (Section 4.1) were assigned and resolved. The primary changes made to the Java source code are summarized below:

1. Resolved SOLID Principle Violations:

- **ISP (D-008):** The primary Interface Segregation Principle violation was fixed by removing the unrelated getFuelLevel() method from the Propulsion interface.
- **DIP / OCP (D-011):** The Rocket class was decoupled from concrete implementations by removing the setIonThruster() method, which violated the Dependency Inversion Principle. The class now relies only on the Propulsion interface, making it open for extension.
- **LSP (D-010):** The RelayCommunication class was refactored to correctly implement the Communicable interface by fixing its transmitData() method signature.

2. Fixed All Critical & High-Severity Defects:

- All compilation-blocking syntax errors were fixed (e.g., 1launchable, private execute = "maneuver", return name+2=3;).
- All critical runtime-crash bugs were eliminated, including the **divide-by-zero** error in Rocket.java (D-001) and the **ArrayIndexOutOfBoundsException** in SpaceDemo.java (D-003).
- All incorrect string comparisons using == were replaced with .equals() (D-012, D-013).
- The NullPointerException risk in Rocket.java's performManeuver() was fixed by adding a proper IllegalStateException check (D-014).

3. Enforced Interface Contracts:

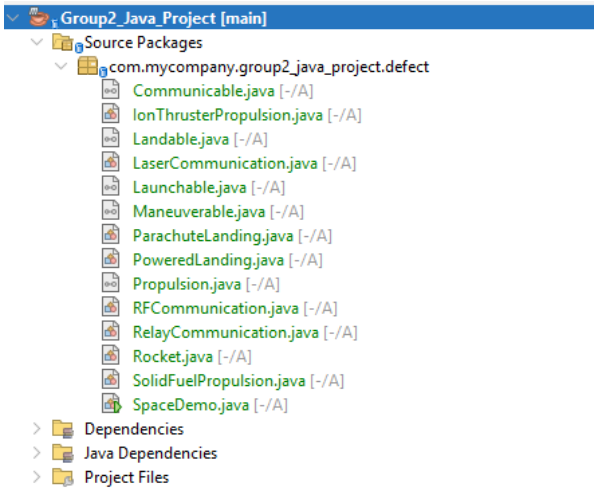
- The Landable interface contract was defined by adding the void land(); method (D-009).
- All implementing classes (ParachuteLanding, PoweredLanding) were updated to @Override this new, parameter-less land() method, resolving the critical compilation failure (D-002).
- IonThrusterPropulsion was modified to correctly implements Propulsion, allowing it to be used polymorphically (D-004).

4. General Code Quality & Best Practices:

- All Java Naming Convention violations were fixed (e.g., SetPropulsion to setPropulsion, maneuverable to Maneuverable).
- Empty catch blocks were populated with e.printStackTrace() to ensure errors are logged (D-015).
- SRP violations, like the side effect in setIonThruster(), were removed (D-016).

The entire codebase is now in a stable, executable state that adheres to our fixed UML design.

5. Snapshot of Workable Project




```
Rocket: initiating launch using SolidFuel
SolidFuel propulsion: Igniting solid fuel and launching with thrust=1000
Rocket: Launch successful.
Rocket: executing maneuver via SolidFuel
SolidFuel propulsion: Performing short-duration maneuver (no throttling).
Telemetry payload: Altitude=1000m;Status=Nominal;AuthToken=SECRET_TOKEN
RF comms: Transmitting telemetry -> Altitude=1000m;Status=Nominal;AuthToken=SECRET_TOKEN
RF Comms Failure: Simulated comms error
Telemetry attempt complete.
Rocket: initiating landing using Parachute
Parachute landing: Deploying parachutes and descending safely.

--- Swap systems at runtime (open for extension) ---

Rocket: executing maneuver via IonThruster
IonThruster propulsion: Executing low-thrust long-duration maneuver.
Telemetry payload: Payload=DataPacket;Source=Laser
Laser comms: Sending high-bandwidth laser packet -> Payload=DataPacket;Source=Laser
Telemetry attempt complete.
Rocket: initiating landing using PoweredLanding
PoweredLanding landing: Performing retro-burn and precision touchdown.
Could not read config file: config.file (The system cannot find the file specified)
Telemetry payload: A
Laser comms: Sending high-bandwidth laser packet -> A
Telemetry attempt complete.
Telemetry payload: B
Laser comms: Sending high-bandwidth laser packet -> B
Telemetry attempt complete.
Telemetry payload: C
Laser comms: Sending high-bandwidth laser packet -> C
Telemetry attempt complete.
Demo complete.
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
Total time:  2.712 s
Finished at: 2025-10-29T20:28:50+05:00
------------------------------------------------------------------------
```

6. Conclusion

This software inspection project provided a comprehensive, practical experience in the principles of Software Quality Engineering. By following a formal inspection process—from planning and preparation to inspection, rework, and follow-up—our team successfully identified and remediated 22 distinct defects from the provided codebase.

The inspection confirmed a direct correlation between poor design architecture and high defect density. The initial UML diagram and code were heavily flawed with violations of ***SOLID principles****, particularly the Interface Segregation Principle (ISP) and the Dependency Inversion Principle (DIP). These design-level issues were the root*

cause of many critical bugs, including compilation failures, runtime crashes (like the Divide by Zero error), and ArrayIndexOutOfBoundsExceptions.

Through the Rework phase, we refactored the entire system to align with our new, SOLID-compliant UML design. This involved:

- *Breaking the "fat interface" into smaller, role-specific interfaces.*
- *Decoupling the high-level Rocket class from low-level concrete implementations.*
- *Fixing all code-level bugs and enforcing type safety.*

Ultimately, this project demonstrated that software quality is not merely about fixing bugs as they appear. It is about building a robust, maintainable, and extensible system from the ground up. The inspection process proved to be an invaluable tool for identifying these deep-rooted design flaws, and the SOLID principles provided the essential "map" to fix them correctly.

Structure:

Description of Items	Pass(Y/N)	Comment
Does the code completely and correctly implement the design?	N	Empty or incomplete branches in SpaceDemo.java (D-018).
Does the code conform to any pertinent coding standards?	N	Naming conventions and indentation not consistent.
Is the code well-structured, consistent in style, and consistently formatted?	N	Inconsistent spacing, capitalization, and method organization.
Are there any uncalled or unneeded procedures or unreachable code?	Y	Unused methods and dummy object “leftover” created.
Are there any leftover stubs or test routines in the code?	Y	Empty finalize () and placeholder methods.
Can any code be replaced by reusable library functions?	N	Custom loops and retry logic could use standard Java utilities.
Are there repeated code blocks that could be condensed?	N	Duplicate loop and exception handling patterns.
Is storage use efficient?	N	Unnecessary object creation in SpaceDemo.java.
Are symbolics used rather than magic numbers?	N	Hardcoded constants: 3, 42, 1000.

Are modules excessively complex and should be split?	N	Rocket.java mixes multiple responsibilities.

Documentation:

Description of Items	Pass(Y/N)	Comment
Is the code clearly and adequately documented with maintainable commenting style?	N	Many empty comments (`/** */`) and missing headers.
Are all comments consistent with the code?	N	Comments do not reflect actual code logic.

Variables:

Description of Items	Pass(Y/N)	Comment
Are variables properly defined with meaningful, consistent names?	N	Violations in naming (D-019, D-020).
Do assigned variables have proper type consistency or casting?	N	Type mismatches found (D-002, D-004).
Are there redundant or unused variables?	Y	“leftover” object unused.

Style:

Description of Items	Pass(Y/N)	Comment
Does the code follow the style guide for this project?	N	Mixed naming and inconsistent indentation.
Is the header information for each file descriptive?	N	Missing or incomplete package and file-level comments.

Is there an appropriate amount of comments?	N	Minimal comments; unclear code flow.
Is the code well-structured typographically and functionally?	N	Logic spread unevenly; poor readability.
Are variable and function names descriptive and consistent?	N	Names violate conventions.
Are magic numbers avoided?	N	Several found (42, 3, 1000).
Is there dead/unreachable code?	Y	Unused methods and imports.
Is any assembly or low-level code removable?	N/A	None present.
Is the code too tricky or hard to follow?	Y	Logic convoluted in Rocket.java.
Is the code self-explanatory?	N	Requires author clarification.

Architecture:

Description of Item	Pass(Y/N	Comments
Is any function too long?	N	Methods short but unclear.
Can code be reused or reuse something else?	N	Missing abstraction; Rocket.java tightly coupled.
Minimal use of global variables?	N	Public fields exist (D-017, D-022).
Are related functions grouped properly?	N	Cohesion violated in Rocket.java.
Is the code portable?	Y	Java platform independent.
Are specific types used (int32, unsigned, etc.)?	N	Generic int types used.
Are nested if/else structures limited to 2 deep?	Y	Within acceptable range.
Are nested switch statements avoided?	Y	None found.

Arithmetic Operations:

Description of Item	Pass(Y/N)	Comments
Avoid comparing floating-point numbers for equality?	Y	No FP comparison issues found.
Prevent rounding errors?	N/A	Not applicable.
Avoid additions/subtractions with large magnitude differences?	N/A	Not relevant.
Are divisors tested for zero or noise?	N	Divide by zero error (D-001).

Loops and Branches:

Description of Item	Pass(Y/N)	Comments
Are loops and branches complete and properly nested?	N	Improper termination in Rocket.java loop.
Are common cases tested first in IF chains?	N	No optimization for common paths.
Are all cases covered in IF/CASE blocks?	N	Missing else/default clauses.
Does every case statement have a default?	N	Some switches lack defaults.
Are loop termination conditions achievable?	N	retry-- > -1 runs extra times.
Are indexes properly initialized before loops?	Y	Yes.
Can statements inside loops move outside?	Y	Some can be moved for efficiency.
Does code manipulate index variable after loop?	N	No misuse observed.

Defensive Programming:

Description of Item	Pass(Y/N)	Comments
Are indexes/pointers tested for bounds?	N	Array Index Out of BoundsException (D-003).
Is input validated for validity and completeness?	N	No input validation.
Are all output variables assigned?	Y	Outputs initialized.
Is correct data used in each statement?	N	Type mismatches found.
Is every memory allocation deallocated?	N	Streams not closed (D-015).
Are timeouts/error traps used for device access?	N/A	No devices used.
Are files checked before access?	N	File Input Stream not checked or closed.
Are files/devices left in correct state on termination?	N	Not handled properly.

Maintainability:

Description of Item	Pass(Y/N)	Comments
Does the code make sense?	N	Logic unclear.
Does it comply with coding conventions?	N	Violations throughout.
Does it follow best practices?	N	SOLID principles broken.
Does it follow comment conventions?	N	Inconsistent and missing comments.
Is commenting clear and adequate?	N	Sparse documentation.

Are ideas presented clearly in the code?	N	Poor readability.
Is encapsulation done properly?	N	Public fields.
Is the code overly complex?	Y	Convoluted logic.
Are there unnecessary global variables?	Y	Public static counters.
Is source code readable top-down?	N	Flow confusing.
Are there unused variables or functions?	Y	Unused object and methods.

Requirements and Functionality:

Description of Item	Pass(Y/N)	Comments
Does code match requirements/specifications?	N	Not fully functional; compile errors.
Is the logic proper and functional?	N	Several runtime and logic bugs.

System and Library Calls:

Description of Item	Pass(Y/N)	Comments
Do all system calls have return status checked?	N	Not checked.
Are errors from system/library calls handled?	N	Exceptions ignored.
Are signals caught and handled?	N/A	Not relevant.
Is mutex used on shared variables?	N/A	No multithreading.

Reusability:

Description of Item	Pass(Y/N)	Comments
Are available libraries used effectively?	N	Custom logic replaces standard utilities.
Are utility methods reused?	N	Code not modular.
Is code generalized for reuse?	N	Too specific to implementation.
Is code a candidate for reuse?	N	Needs major refactor.

Robustness:

Description of Item	Pass(Y/N)	Comments
Are all parameters checked?	N	No validation.
Are error conditions caught?	N	Exceptions swallowed.
Default case in all switch statements?	N	Missing in some.
Is there non-reentrant code in unsafe areas?	N/A	Not applicable.
Is macro usage proper?	N/A	None used.
Any unnecessary optimization hindering maintenance?	N	None, but inefficient logic exists.

Security:

Description of Item	Pass(Y/N)	Comments
Does the code pose a security concern?	Y	Hardcoded secret token.
Are service methods annotated with @Authorize?	N/A	Not applicable.
Is inclusion whitelist used for input validation?	N/A	No user input.
Is all user input encoding set by server?	N/A	Not applicable.
Is character encoding set by server?	N/A	Not applicable.
Are cookies with sensitive data secure?	N/A	Not used.
Are input surfaces validated to prevent XSS/SQLi?	N/A	No web module.
Does design address canonicalization issues?	N/A	Not relevant.

Control Structures:

Description of Item	Pass(Y/N)	Comments
Does the app log sensitive data in plain text?	N	No logs observed.
Sensitive data stored in cookies?	N/A	None.
Is sensitive data stored unencrypted?	Y	Auth token hardcoded.
Is encryption used for transmission?	N/A	No network layer.

Is caching disabled for sensitive data?	N/A	Not applicable.

Is email transfer encrypted?	N/A	Not applicable.
Does code use infinite loops?	N	No infinite loops.
Does loop iterate correct number of times?	N	retry loop runs extra iterations.

Resource Leaks:

Description of Item	Pass(Y/N)	Comments
Does code release resources?	N	FileInputStream left open.
Does code release resources twice?	N	No duplicate releases.
Is most efficient class used for resources?	N	Could use try-with-resources.

Error Handling:

Description of Item	Pass(Y/N)	Comments
Does code follow exception handling conventions?	N	Exceptions ignored.
Does code use exception handling properly?	N	Improper catch and print Stack Trace only.
Does code simply catch and log exceptions?	Y	Only stack trace logged.
Does code catch general Exception?	Y	Catches java.lang.Exception.

Are expected values validated?	N	Missing sanity checks.
Are parameters checked for validity?	N	No null checks.

Are errors propagated correctly?	N	Exceptions swallowed.
Are null pointers handled?	N	Null Pointer Exception risk (D-014).
Do switch statements have defaults?	N	Missing.
Are arrays checked for bounds?	N	Fails at D-003.
Is garbage collection done properly?	N	finalize() misused.
Is overflow/underflow checked?	N	Divide by zero bug.
Are errors logged meaningfully?	N	Generic stack traces only.
Would try/catch be useful?	Y	Yes, needed for risky sections.

Timing:

Description of Item	Pass(Y/N)	Comments
Is worst-case timing bounded?	N	retry loop unbounded.
Any race conditions?	N/A	No threads.
Is thread safety ensured?	N/A	Single-threaded.
Any long-running ISRs?	N/A	Not applicable.
Is priority inversion handled?	N/A	No RTOS.
Is watchdog timer used?	N/A	Not applicable.

Has code readability been sacrificed for optimization?	N	Code unoptimized but readable.

Validation & Test:

Description of Item	Pass(Y/N)	Comments
Is code easy to test?	N	Coupled and complex logic.
Do unit tests have full coverage?	N	No test suite.
Is code warning-free on compile?	N	Syntax/type errors.
Are corner cases tested?	N	No handling for invalid inputs.
Can faulty conditions be injected?	N	No test hooks.
Are all interfaces tested?	N	Missing interface validation.
Is worst-case resource use validated?	N	No profiling.
Are assertions used?	N	None present.
Is commented-out test code removed?	Y	No leftover test comments.

Hardware:

Description of Item	Pass(Y/N)	Comments
Do I/O operations set correct hardware state?	N/A	No hardware control.
Are min/max timing requirements met?	N/A	Not applicable.
Multi-byte register consistency ensured?	N/A	Not applicable.
Does software reset to known state?	N/A	Not applicable.
Are brownouts handled?	N/A	Not applicable.
Is system correctly configured for sleep modes?	N/A	Not applicable.

Unused interrupts directed to handler?	N/A	Not relevant.
EEPROM corruption avoided?	N/A	Not applicable.